IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

DONNA CURLING, ET AL., Plaintiffs, v. BRAD RAFFENSPERGER, ET AL, Defendants.	CIVIL ACTION FILE NO. 1:17-cv-2989-AT

DECLARATION OF JUAN E. GILBERT, PH.D.

Pursuant to 28 U.S.C. § 1746, I, Juan E. Gilbert, make the following declaration:

I. BACKGROUND

1. My name is Juan E. Gilbert

2. I have been retained by Robbins Ross Alloy Belinfante Littlefield LLC and Taylor English Duma LLP on behalf of the Georgia Secretary of State and the State Election Board members. I have been asked to offer opinions regarding the declarations and exhibits attached to Plaintiffs' recent Motions for Preliminary Injunction.

3. Specifically, I have reviewed the October 2, 2019 Declaration of J. Alex Halderman, the Def Con 27 Voting Machine Hacking Village August 2019 Report, "Ballot-marking devices (BMDs) cannot assure the will of the voters" authored by Andrew Appel, Richard DeMillo, and Philip Stark (the "Appel White Paper"), the October 22, 2019 Declaration of Philip B. Stark, and the October 22, 2019 Declaration of Kevin K. Skoglund.

4. My background, experience and qualifications are set forth in my curriculum vitae, which is attached as **Exhibit A**. As demonstrated by my curriculum vitae, I have over 20 years of post-graduate experience in the field of computers generally, and since 2002 I have focused on technology in voting systems, including the development of accessible voting systems.

5. I currently hold the title of Andrew Banks Family Preeminence Endowed Professor and Chair of the Computer & Information Science & Engineering Department at the University of Florida where I also lead the Human Experience Research (HXR) Lab. I have held the title of Department Chair at the University of Florida since 2015 and joined the faculty there as Professor and Associate Chair in 2014.

6. I have earned a Bachelor of Science in Applied Science from Miami University in Oxford, Ohio (1991); a Master of Science in Computer Science from the University of Cincinnati (1995); and a Doctor of Philosophy in Computer Science from the University of Cincinnati (2000).

7. Prior to joining the University of Florida, I held the title of Presidential Endowed Professor and Chair of the Division of Human-Centered Computing at Clemson University in Clemson, South Carolina (2009-2014) and also held the position of Graduate Program Director in the Division of Human-Centered Computing (2010-2012). Additionally, I held the title of Professor (2009), Associate Professor (2005-2009), and Assistant Professor (2000-2005) at Auburn University in Auburn, Alabama. I was also a Visiting Instructor in the Miami University (OH) Systems Analysis Department.

8. I was a member of the National Academies of Science, Engineering and Medicine ("NASEM" or "National Academies") Committee on the Future of

Voting: Accessible, Reliable, Verifiable Technology which produced the report "Securing the Vote: Protecting American Democracy." Additionally, I participated on NASEM Committees regarding developing interest in and mentoring in Science, Technology, Engineering, Medicine, and Mathematics ("STEMM").

9. In 2018, I was named a Fellow of the Association for Computing Machinery, the highest honor awarded by the Association reserved for, at most, 1% of ACM members in recognition of outstanding accomplishments in computing and information technology.

10. At various times, I have also served as a reviewer for various academic journals, including: *Journal of Women and Minorities in Science and Engineering*, *Computers & Security Journal*, *Journal of STEM Education*, and the *International Journal of Artificial Intelligence in Education*. I have also served on multiple panels and committees for the National Science Foundation.

11. In 2012, I received the Presidential Award for Excellence in Science, Mathematics, and Engineering from President Barack Obama. I have also received awards from the American Association for the Advancement of Science (AAAS) (2014) and the Computer Research Association (2018)

12. In my career, I have published more than 180 articles, delivered over 250 presentations and obtained more than $27 million in grants and funding in the field of computer science, generally. Specifically, I also was selected to direct a

three-year, $4.5 million project funded by the U.S. Election Assistance Commission to increase the accessibility of new, existing, and emerging technological solutions in the design of voting systems.

13. I have provided expert testimony to the Presidential Commission on Election Administration and Technology (September 19, 2013), the U.S. Congressional Committee on Rules and Administration, Bipartisan Electronic Voting Reform Act of 2008 (July 30, 2008), and in the case *National Federation of the Blind v. Lamone*, No. RBD-14-1631, 2014 WL 4388342 (D. Md. Sep. 4, 2014).

14. My research and work is currently focused in Human-Centered Computing, Natural Interactive Systems, Artificial Intelligence, Machine Learning, and Advanced Learning Technologies. Generally, my research focuses seek to integrate people, technology, information, and policy to address real world problems. Relatedly, I focus on creating user interfaces where a user can interact with computer systems using speech and multimodality, and employing intelligent strategies to personalize instruction to users.

15. In 2003, at the Auburn University Human Centered Computing Lab, I conceived the Prime III Voting System. Prime III is an open-source paper-based Ballot-Marking Device ("BMD") Voting System which offers a secure, multimodal electronic voting system that delivers system security, integrity, and user satisfaction while accommodating all users with the same voting method, regardless

of ability. I have continued refining and developing new advancements of this voting system during my time at Clemson University and the University of Florida.

16. I created Prime III to advance the state of voting in the wake of the 2000 Presidential Election. Prime III was designed to be software independent by using a paper ballot. The Prime III Voting System has been used in federal, state, and local elections. The State of New Hampshire adopted the Prime III voting system as their statewide accessible voting system and renamed it One4All.

II. Georgia's BMD System and Plaintiffs' Requested Relief

A. Georgia's BMD Voting System

17. I have reviewed documentation regarding the Dominion BMD Voting System Georgia is implementing, I understand it to generally consist of the following:

A. Dominion Election Event Designer Election Management System ("Dominion EMS").

B. Dominion Image Cast Prime X Ballot Marking Device and a separately attached printer ("Dominion BMD").

C. Dominion ImageCast Precinct Scanner and Tabulator ("Dominion ICP").

D. Paper for printing of paper ballots by the Dominion BMD (the

"Paper Ballot").

E. Dominion ImageCast Central which includes a Dell PC and a separately attached high-speed scanner for use in elections offices to process absentee ballots ("Dominion ICC").

F. KNOWink Poll Pad Electronic Poll Book for voter check in and creation of Voter Access Cards which store only ballot combination information for voting on the Georgia BMD ("Poll Pad").

18. Precinct Voting. I understand Georgia's BMD Voting System to generally work as follows on election day: Voters will arrive and check-in with poll-workers using the Poll Pad. The Voter will then be given a Voter Access Card to take to the Dominion BMD. A Voter will then insert the Voter Access Card and be presented with their ballot on the BMD screen. Voters will then select their candidates on the BMD screen and the BMD will print a paper ballot reflecting their selections from the attached printer. The paper ballot contains a human-readable listing of voter selections and a QR Code encompassing the selections. Voters then have the opportunity to review their ballot and will be instructed to do so by posted signage. After reviewing their ballot, voters then insert the ballot into the Dominion ICP to scan and record their vote. Importantly, there is no recording of a voter's selection on the Dominion BMD and the only device tabulating and

"counting" votes is the Dominion ICP.

19. Pre-certification Audits. I understand that Georgia law requires local election superintendents to conduct precertification tabulation audits conducted by manual inspection of random samples of the official paper ballots. Importantly, under Georgia law, the paper ballot is the ballot of record and controls in such an audit.

20. Risk-Limiting Audits ("RLAs"). I understand that Georgia law also requires the Secretary of State to conduct a risk-limiting audit pilot program with a risk limit of not greater than ten percent. Upon successful completion of the Risk-Limiting Audit pilot program, Georgia law requires state-wide implementation of Pre-certification Risk-Limiting Audits. Again, the paper ballot is the ballot of record and controls in the audit.

21. As an expert in the field, I believe that the process described herein is consistent with best practices for conduct of elections and is consistent with the recommendations produced by the National Academies Committee on the Future of Voting: Accessible, Reliable, Verifiable Technology of which I was a member. Accordingly, it is also consistent with that Committee's report: "Securing the Vote: Protecting American Democracy."

22. Specifically, the Georgia BMD Voting System does not store a ballot or ballot information on the Dominion BMD, the ballot only contains a human-

readable summary and QR Code, the paper ballot is the official ballot of record, and the ballot does not pass through a printer-head when scanning.

23. Moreover, the use of RLAs was strongly recommended by the NASEM Committee on the Future of Voting. I think the pilot of an RLA system is necessary before state-wide implementation to ensure its fidelity and integrity. I understand that Georgia election officials have visited other jurisdictions to learn from those election officials about the process of, and best practices for, conducting an RLA.

24. Finally, the Dominion BMD System has been certified by the EAC pursuant to the Voluntary Voting System Guidelines ("VVSG") 1.0. I understand that Plaintiffs complain the system has not been certified pursuant to the more recent VVSG Standards (i.e. VVSG 1.1 or VVSG 2.0), but no election system in the country has been certified under those standards.

B. Plaintiffs' Requested Relief

25. I understand that there are two different sets of Plaintiffs in this case seeking similar relief that is different in some respects. I will refer to the sets of Plaintiffs as Curling Plaintiffs and Coalition Plaintiffs.

26. Curling Plaintiffs. I understand that Curling Plaintiffs ask this Court to prohibit the State of Georgia from "using any system or devices for voting . . . that does not use hand-marked paper ballots as the primary method of recording the

elector's votes" and require the State to provide a plan to the Court to comply with that relief which includes pre-certification, post-election, manual tabulation audits." [Doc. 619-1].

27. Coalition Plaintiffs. I understand that Coalition Plaintiffs seek to similarly require the State to conduct all elections using hand-marked paper ballots as the primary method of recording electors' votes. Coalition Plaintiffs further seek to permit continued use of Georgia's old optical scanners, provide expanded paper back-ups of poll books and develop an auditing plan to be submitted to the Court and Plaintiffs, among other requests.

III. THE DIFFERENCES AND SIMILARITIES OF BALLOT-MARKING DEVICES AND HAND-MARKED PAPER BALLOTS

28. I will begin by defining the specific implementation of a BMD for this Declaration. Herein, when I refer to a BMD, I am specifically referring to an implementation that has the following properties:

A. The BMD does not record any voter information;

B. The BMD does not record any of the voter's choices;

C. The BMD prints a paper ballot that contains a QR Code containing the voter's selections (unless specifically noted otherwise in this section of my Declaration) and a ballot summary reflecting the voter's selections that is human-readable; and

D. The paper ballot is fed into a separate machine or optical scanner, that is separate and apart from the BMD, for tabulation.

29. As noted previously, I understand Georgia's BMD Voting System to comply with Paragraph 28 (A–D).

30. Similarly, when I refer to hand-marked paper ballots, I am referring to a system consisting of the following properties:

A. A voter marks his or her selections with a pen or pencil on a paper ballot; and

B. The ballot is then fed into a machine or optical scanner which tabulates the votes (unless otherwise specifically noted herein).

31. There are many similarities between a BMD Voting System and a hand-marked paper ballot voting system.

32. And, in my opinion, the similarities of both systems provide a baseline confidence of security, but the advantages of a BMD system with respect to undervotes, overvotes, auditability, and accessibility weigh in favor of a BMD system.

A. The Similarities

33. Both BMD and hand-marked systems are paper based. This is very different from the Direct Recording Equipment (DRE) that I understand Georgia previously used. It is difficult, if not impossible, to effectively secure a voting system that is only electronic; therefore, the National Academies report and I agree, all elections should be paper based until the state of technology advances and undergoes a rigorous review. Both BMD Voting Systems and hand-marked paper ballot voting systems are appropriately recorded and secured by physical paper, consistent with this recommendation.

34. Both are read by optical scanners. The scanners used by both BMD and hand-marked paper ballot voting systems are the machines that actually record votes (I understand that some jurisdictions hand-count paper ballots but I do not understand Curling or Coalition Plaintiffs to seek that in this case. Accordingly, though there are obvious issues with human error or malfeasance in hand-counting election results, I will not discuss that herein).

A. Optical scanners are computers and they therefore may be

susceptible to manipulation. However, this applies with equal force to both BMD and hand-marked paper ballot voting systems. This susceptibility is why audits are recommended for both hand-marked paper ballot and BMD voting systems.

B. Additionally, optical scanners read both ballots in a similar manner. In a BMD Voting System, the scanner reads a QR Code. In a hand-marked paper ballot voting system, the scanner does not read ballot text like a human would. Instead, the scanner is translating coordinates of an oval or other mark into coordinates that are coded to mark a vote for a candidate—assuming the mark is within the specified coordinate space. As such, in both systems, a scanner is translating information in a similar manner under either system, using either coordinates or a QR Code to translate into a recorded vote.

35. Both are auditable. Both BMD and hand-marked paper ballot voting systems can be audited by an RLA or a recount to confirm the tallies of the optical scanners. Since the human-readable record controls under either system, an audit or recount can reveal any issues with the tally, whether due to a misread or malfeasance. I understand Plaintiffs' Experts dispute this, which I will address in the rebuttal portions of this Declaration.

B. The Differences

36. While there are many similarities between hand-marked paper ballot and BMD voting systems, there are also some significant differences. Again, I will continue to refer to both systems as defined above.

37. Undervotes. Generally, an undervote occurs whenever a voter (consciously or inadvertently) does not vote in a race on their ballot.

A. Hand-marked paper ballot systems provide no limitation on undervotes absent a poll-worker reviewing a voter's ballot and informing the voter of an undervote or the scanner being programmed to reject a ballot due to detecting an undervote. However, either of these remedies for hand-marked paper ballot systems are problematic because (1) Georgia protects the secrecy of the ballot and poll-worker review of individual ballots could lead to intimidation; and (2) refusing to vote in a particular race may be a conscious choice of a voter that he or she is entitled to make.

B. BMD systems on the other hand often provide a notification, by way of either an on-screen summary or the printed summary on the ballot of no selection or something similar. This provides voters a way to be privately informed of their undervote and

remedy it if they so choose. I have not personally observed this notification on the Dominion BMD but I understand Georgia's implementation of that BMD does confirm this via both an on-screen summary and human-readable text on the ballot.

C. Undervote Hack. Hand-marked paper ballot systems are subject to undervote attacks with only a pen or pencil that no scanner or audit would catch. This is a significant vulnerability from an election security perspective that is rarely discussed. In the case of a hand-marked paper ballot undervote, no mark is made on a ballot and the "oval" is left blank. In a matter of seconds an insider could fill in any undervotes with their preferred candidate and the only way to detect this attack would be to catch them in the act. It is not possible on a printed BMD ballot to interfere with an election in this simple manner.

D. Disparate Impact on Minority Voters. I have reviewed the Report of the 21st Century Voting Commission submitted to Governor Roy Barnes in December 2001.[1] Concerningly, that

[1]Report of the 21st Century Voting Commission, 18-19 (December 2001) (*available at* https://www.sos.state.co.us/pubs/elections/VotingSystems/files/2015/21stCenturyReport.pdf) (hereinafter 21st Century Report).

Commission's review of data from the 2000 Presidential Election in Georgia found that undervote rates[2] were higher in predominantly black precincts than in predominantly white precincts, both of which used systems that permit undervotes. While I have not personally conducted research on this finding or reviewed the underlying data, I have no reason to doubt the Commission's work—the finding is disturbing and should be addressed before any switch to a system that permits undervotes.

38. Overvotes. An overvote occurs when a voter selects more candidates than is permitted in an election.

A. A hand-marked paper ballot system, just as in undervoting, provides no limitation to prohibit overvoting. In theory, a scanner could be programmed to reject an overvoted ballot, but in practice this could result in long lines and delayed voting at precincts when the voter has to re-mark a new ballot. This could

[2] Due to lack of data available at the time, the Commission indicates the undervote rate it found also includes overvotes. In other words, an overvote (marking to candidates for the same race) led to a non-vote in that race and due to the way that data was collected at the time non-votes were all counted as overvotes. Accordingly, this finding may apply with equal force to overvotes, but more research would need to be conducted.

lead to voter frustration and voters choosing not to vote. Further, I am not aware of any research or data showing this is an effective method of eliminating overvotes. Poll-worker review of ballots presents the same problems discussed in Paragraph 36(A).

B. BMD voting systems, on the other hand, eliminate this problem. Again, I have not personally used a Dominion BMD as configured for Georgia, but I understand that if a voter attempts to overvote in a particular race on a Dominion BMD it will prohibit that voter from doing so. The voter must de-select their other choice before being permitted to select a new choice.

C. Overvote Hack. This is another vulnerability that is rarely discussed but is a real threat that requires only a pen or pencil and no specific training or sophistication. For example, if a voter selects Bugs Bunny for Governor of Georgia but an insider wants Daffy Duck to win, an insider can simply overvote the ballot for Daffy Duck. In such a scenario the ballot then may be either an uncounted vote that was intended to be cast for Bugs Bunny or worse, a decision regarding voter intent is later made to count the ballot for Daffy Duck. It is not

possible on a printed BMD ballot to interfere with an election in this simple manner.

39. Auditability, Recounts, and Voter Intent. While, as mentioned in the Similarities section above, both hand-marked paper and BMD voting systems can be audited, BMD voting systems provide significant advantages in this context.

A. A hand-marked paper ballot can be marked in any way a voter chooses. This results in marks that may be read by the scanner differently from the way the voter intended (e.g. a stray mark in a different bubble) or may not be read at all. This would not require criminal conduct but the effect of not recording a voter's intent accurately is the same. Moerover, this results in a situation where officials conducting an audit must interpret the voter's intent—the worst-case scenario for an audit or recount.

B. The primary goal of having a paper ballot is to enable an audit to ensure the integrity of the election; therefore, the audit or manual recount is the final say in the election outcome. If the auditability of the ballots is compromised, then the audit/recount fails. This has been seen in many elections starting with Florida's 2000 Presidential Election and later in elections that used HMPB like the 2008 Minnesota Senate Race

or the 2010 Alaska Senate Race. Some will argue that these ballots are a minority and that is true, but they exist and still could have an impact on a close election.

C. Ambiguous marks cannot occur on a BMD: the voter's intent is clear in the ballot summary and an auditor will not be asked to interpret voter intent.

D. Some will argue that the QR Code is not human-readable; therefore, this is a problem. This is only an issue if the QR Code is the ballot of record and there is no RLA and/or pre-election testing. If QR Codes are inconsistent with the human-readable portion of the ballot, this will be detected during the RLA and may signal a full manual recount.

E. A QR Code can also be examined during pre-election testing or post-election audits or recounts to confirm its validity.

F. Finally, in the future, a QR Code may provide a stronger audit trail to detect errors or malfeasance. A QR code could be programmed to contain information to trace a ballot back to a particular precinct or machine. While I understand this particular feature has not yet been approved by the Election Assistance Commission, so long as this can be done in the

future without compromising ballot secrecy, this is a significant advantage to uncovering issues by way of audits.

G. Even without this additional advancement in technology, in my opinion, a QR Code provides a significant advantage in auditing because it can unambiguously reveal malfeasance or errors. And because the ballots contain the voter's selection in human-readable format which controls in any recount or audit, an error could be remedied by a manual recount.

40. Accessibility. As mentioned elsewhere in this Declaration, a significant portion of my research and the motivation behind the Prime III voting system is the accessibility of elections systems. Simply put, a hand-marked paper ballot system is not accessible to voters with disabilities while a BMD system is. While this presents policy and legal problems, it also exacerbates security vulnerabilities in elections.

A. First, voters with certain disabilities cannot use hand-marked paper ballots without human assistance which violates their privacy. For example, a blind voter cannot use a paper ballot at all without assistance and a voter with limited motor function and coordination may also have difficulty properly marking a ballot on his or her own. The same may be true for certain

elderly voters whose motor skills are declining.

B. BMD systems however are more accessible to these voters. BMDs are easier to touch for voters with weak motor skills and/or have adaptations for use with the same device. Similarly, BMD systems can audibly dictate to a voter their choices on the same machine that the general populace uses. Again, while I have not personally used the Dominion BMD system as procured for Georgia, I understand that it has this capability. It has adaptations for a control, audible instructions and feedback, and even an adaptation for a sip-and-puff device for severely disabled voters. Even for those without a severe disability, BMDs have the capability to increase text size and change text color to enhance readability.

C. When hand-marked paper ballot systems have been recommended in other contexts, it is often due to the alleged vulnerabilities of a particular voting system. However, in many instances proponents of hand-marked paper ballots while arguing that BMDs are insecure suggest that it is OK for people

with disabilities to vote on. This is unacceptable[3] in my opinion and threatens the security of an election.

D. If individuals with disabilities vote one way and everyone else votes a different way, this provides fertile ground for an attack. When an attacker knows the specific limitation of the population using a certain system, it is easier for that attacker to tailor an attack without being detected.

E. Further, the number of disabled voters may be larger than the margin of victory in many critical jurisdictions. For example, it is estimated that disabled eligible Georgia voters numbered approximately 1.136 million, 16.1% of all eligible voters, in the 2016 elections[4] and nationwide turnout of disabled voters was estimated at 55.9%.[5] Using this rough estimate, approximately

[3] While I understand certain federal or state laws may be implicated by the scenario described here, I am not a lawyer and am not offering any opinion on the **legal** sufficiency of any system.

[4] Projecting the Number of Eligible Voters with Disabilities in the November 2016 Elections, L. Schur and D. Kruse, Rutgers University (2016) (*available at* https://smlr.rutgers.edu/sites/default/files/documents/faculty_staff_docs/Kruse%20and%20Schur_Disability%20electorate%20projections%202016_9-8-16.pdf).

[5] L. Schur, Disability, Voter Turnout, and Polling Place Accessibility, Presentation to National Academies of Sciences, Engineering, and Medicine's Committee on the Future of Voting (Jun. 2017) (*available at* https://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_180931.pdf).

635,000 disabled voters cast votes in Georgia in 2016, far greater than the 211,411-vote difference between Donald Trump and Hillary Clinton in Georgia.[6]

F. Setting aside my concerns regarding voter accessibility, from a security perspective, it is better to have a diversity of voters using the same equipment rather than isolating a certain demographic of voters by type of equipment or voting process.

IV. REBUTTAL OF PLAINTIFFS' DECLARATIONS AND EXHIBITS

A. October 2, 2019 Declaration of Dr. J. Alex Halderman

41. I have reviewed the Declaration of Dr. J. Alex Halderman, dated October 2, 2019, and filed with this Court, all Paragraph references herein refer to that document, [Doc. 619-2], unless explicitly stated otherwise. I offer the following opinions in rebuttal.

42. In Paragraph 3, Dr. Halderman states "important databases, files, computers, and personnel will carry forward from the current election system (the "GEMS/DRE System"). This means that vulnerabilities in these aspects of the GEMS/DRE System will also affect the security of the [Georgia BMD Voting System]."

[6] Georgia Secretary of State, November 8, 2016 Election Results (*available at* https://results.enr.clarityelections.com/GA/63991/184321/en/summary.html).

43. As a preliminary matter, it is unclear to me what, exactly, Dr. Halderman means to say will "carry forward," but it appears contrary to the facts of Georgia's BMD Voting System. In any event, the Georgia BMD System includes a new EMS which replaces the old GEMS in its entirety and there is simply no software continuity between the two systems to transmit viruses or malware. If he is referring to the general framework of building ballot combinations and ballot data then that is a separate matter entirely for two reasons. First, I understand that Georgia law requires export files from any Voter Registration System to be scanned with anti-virus and anti-malware software before use in any other elections system along with endpoint protection and a host of other requirements regarding security of any existing voter database files.[7] Second, this assertion is irrelevant to the security of the new BMD Voting System itself since there is no software or hardware connection to infect the new equipment. I assume that some personnel will remain in the Secretary of State's Office, but I also assume Dr. Halderman is not suggesting that all personnel be removed or that the Secretary's Office has been infiltrated by attackers employed there. Simply put, the Georgia BMD system is an entirely new and separate Voting System.

44. In Paragraph 4 Dr. Halderman states that "BMDs are computers, meaning they are susceptible to hacking." I agree that generally any computer can

[7] O.C.G.A. § 45-13-20; Ga. Comp. r. & Reg. 590-8-3-.01.

be hacked, but I understand Plaintiffs' proposed systems to also utilize computers for voter registration and computerized scanners for tabulation. These can also, in theory, be hacked. Additionally, as described above, hand-marked paper ballots themselves can be "hacked" by far less sophisticated means. In sum, the general statement that computers can be hacked is no justification to remove all computers from any type of interaction with voting and elections systems.

45. In Paragraph 5, Dr. Halderman states that use of barcodes generally increases the "attack surface." I do not generally dispute this is the case. And in Paragraph 6, Dr. Halderman goes on to explain a "plausible attack scenario" where a barcode is altered to encode a vote for one candidate but the summary remains for the other.[8] As Dr. Halderman acknowledges though, an effective RLA would catch this "plausible scenario."

46. But, Dr. Halderman's "plausible attack scenario" could occur with a hand-marked paper ballot system. As previously discussed, an insider could simply mark ballots (resulting in a ballot not counting or counting differently than the view of the ballot when the voter completed it) or an attack could be made on optical scanners to re-code how the ballot reads a legitimate mark. And, again, a scanner is not reading the text of a ballot in either system, it is translating either coordinates

[8] As an aside, I do not understand "barcodes," as commonly known, to be at issue in this case. Instead, the Dominion BMD System uses QR codes. For the sake of argument and clarity, I will not correct Dr. Halderman's terminology.

(hand-marked ballot) or a QR code (BMD ballot) into a vote.

47. In Paragraphs 9-11 Dr. Halderman discusses a contemplated update to the Dominion BMD System available after certification by the United States Election Assistance Commission. First, EAC certification is a significant point, in and of itself: Certification means that a system complies with the security and fidelity requirements of the federal agency charged with this task and is necessary to provide assurance of a voting system's integrity. Importantly, the Dominion System that Georgia is deploying has been certified by the EAC. Second, I would be surprised if Dr. Halderman believes that Georgia should use a non-certified system, in which case I am unsure what his assertion is other than he prefers BMD systems which use Optical Character Recognition ("OCR") even though it has not yet been certified.

48. In Paragraphs 12–17, Dr. Halderman generally asserts that BMD systems cannot be voter-verified and therefore cannot be audited. For reasons stated previously, I believe this broad assertion is incorrect (in fact, in my opinion, BMD ballots with two forms of vote recordation may be a more reliable record for auditing). I provide the following specific points rebutting this assertion.

49. First, Dr. Halderman cites his own research at the University of Michigan which is apparently undergoing peer review now. I cannot specifically rebut the underlying data since he did not provide it.

50. Second, footnote 4 of Dr. Halderman's declaration summarily states that certain reminders improved this percentage, but Dr. Halderman chose not to include those numbers in his declaration. He further did not document the numbers regarding the interventions he says "had no effect." Surely Dr. Halderman is aware that H.B. 316 requires signage in each polling booth reminding voters to check their ballots, it is surprising to me he would not include this number. In the same footnote, he concludes further research and testing are necessary to establish whether interventions are effective. However, he certainly would also agree that further research must be done to establish the 6.5% rate of participants noticing a ballot change must be conducted to conclusively establish that assertion.[9]

51. Conversely, I am aware that Dr. Michale Byrne, Professor of Psychology at Rice University, has conducted research that shows significant gains in voters reviewing their ballots when a poll worker prompts them to do so.

52. In Paragraph 16 Dr. Halderman states "It is true that voters using hand-marked paper ballots also make errors. However, for the most part, human errors in hand-marked paper ballots tend to be random. Errors that favor a candidate

[9] Again, I cannot conclusively comment on this without any of the data backing up Dr. Halderman's assertions, but logically one would need to also control for the real impact of a *real* election in such a study. In other words, a voter's knowledge and thought about voting for a candidate leading up to an election is far different than a mock election voting for people who may not be real, or just an election which we *know* is not real.

tend to be largely canceled out by errors that disfavor that candidate. This has a tendency to equalize the effect of errors across parties or ideologies." Dr. Halderman provides no evidence or data to support either claim: that hand-marked paper ballot "errors are random;" and that they equalize or cancel each other out.

53. As to Dr. Halderman's assertion that the marks are random, there is no indication on a hand-marked paper ballot that a mark is indeed "random." Instead, the mark may be evidence of the intention of a voter to cross-out or circle a candidate, disregarding the instructions. In any event, the conclusory statement here does not establish marks as a general rule are "random" without any evidence or support.

54. Additionally, the 21st Century Report I referenced earlier tends to negate his assertion that the errors cancel each other out. There, overvotes and undervotes on hand-marked paper ballots were far more prevalent in majority-minority precincts.[10] Regardless, this conclusory statement is not supported by any peer-reviewed evidence cited by Dr. Halderman or that I am generally aware of.

55. In Paragraph 15, Dr. Halderman states that if a problem were discovered that altered *both* the ballot summary and the QR Code then the only remedy would be to rerun the election. But the same is true with hand-marked paper ballots. If a bad actor altered hand-marked paper ballots by marking them

[10] 21st Century Report, *supra* n. 1, pp. 18-20.

(completing undervotes, purposely adding overvotes, or simply attempting to spoil ballots with ambiguous marks) to influence an election (or maybe even just poor ballot design and confusion), there would be no evidence indicating which mark is the "correct" mark. Accordingly, the only corrective action that could be taken is the same: a rerun of the election.

56. Moreover, under Dr. Halderman's "plausible attack scenario," of an attacker altering the QR Code but not the summary, a hand-marked paper ballot would be worse. With a BMD system, a properly conducted RLA would detect an attack and the human readable portion is again the official ballot of record.[11] Under a hand-marked paper ballot system, if a bad actor marks ballots, an RLA could not conclusively determine malfeasance had occurred.

B. October 22, 2019 Declaration of Philip B. Stark

57. I have reviewed the Declaration of Philip B. Stark, dated October 22, 2019, and filed with this Court, all Paragraph references herein refer to that document, [Doc. 640-1, pp. 40–45], unless explicitly stated otherwise. I offer the following opinions in rebuttal.

[11] I note here that Plaintiffs' experts will presumably assert that a BMD cannot be verifiable because the QR code cannot be read by the naked eye. However, Dr. Halderman has already stated interventions which he believes increase verifiability, I have additionally pointed to Dr. Byrne's research, and Dr. Halderman has provided no evidence as to the review voters conduct on a hand-marked paper ballot.

58. Dr. Stark[12] states in Paragraph 2 that "BMDs are essentially as vulnerable as the DRE machines they would replace, despite the fact that BMDs generate a 'voter-verifiable' paper trail." I fundamentally disagree with this statement and it, in my opinion, is misleading. As an expert in the field of elections and developer of a voting system myself, paper-ballot based BMDs are more secure than DREs. Moreover, the National Academies Securing the Vote Report agrees BMDs are more secure as well. I am familiar with Dr. Stark and can only assume that the term "essentially" is being used to carry that statement.

59. In Paragraph 5, Dr. Stark states "Bugs, misconfiguration, or malicious hacking can cause the BMD to print something other than the selections the voter made on the touchscreen or accessible interface. Hand-marked paper ballots do not have that vulnerability." This is simply not true. To my knowledge, every jurisdiction using hand-marked paper ballots has processes in place to determine voter intent, because marks on a hand-marked paper ballots can be ambiguous, as previously discussed. Additionally, poor ballot design can cause voter intent to be unclear with hand-marked paper ballots, even where there is no ambiguous mark—for example, a voter may think an "oval" corresponds to a different candidate. This is the same vulnerability Dr. Stark is describing, a ballot that does not clearly reflect

[12] I understand Dr. Stark to be a statistician, but he appears to offer opinions regarding computer and elections security and not statistics. Nonetheless, I will address his contentions.

a voter's intent whether due to malfeasance or human error.

60. In Paragraph 7, Dr. Stark goes on to state: "If an audit or inspection of a BMD happens to discover a malfunction, there is in general no way to tell whether the malfunction altered electoral outcomes, nor any way to determine the correct electoral outcomes." The BMDs, however, are not recording or tallying votes, they are producing paper ballots which can be reviewed and confirmed by a voter. In essence, a BMD is nothing more than an ink pen—but one that can avoid ambiguous marks that belie voter intent.

61. In Paragraph 8, Dr. Stark states that BMDs are not "strongly software independent" and that only hand-marked paper ballots can detect whether a malfunction altered the outcome. First, I disagree with Dr. Stark that hand-marked paper ballots are "strongly software independent." For example, if undervote and overvote hacks occur with paper ballots, there's no way to recover the election other than a do over. As such, hand-marked paper ballots are not "strongly software independent" Instead, I believe that both BMDs and hand-marked paper ballots have the same property of being software independent but not *strongly* software independent.

62. Regardless of semantics, this statement simply misses the point. Take, for example, the 2018 Election to United States Senate in Florida. In that race, there was a severe undervote in the Senate race—more than 24,000 voters who voted in

the race for Governor failed to vote in the U.S. Senate race with a margin of victory of about 11,000—and a consensus has developed that this was due to poor ballot design.[13] In this instance, there is still no remedial action other than simply counting the ballot that likely contained an error, regardless of software independence.

63. In Paragraph 13, Dr. Stark references a paper titled "What Voters Are Asked to Verify Affects Ballot Verification: A Quantitative Analysis of Voters' Memories of Their Ballots" to support his claim that voters are not good at verifying their ballot summaries.[14] This is a flawed study and this paper was not subject to peer review. In that study, they asked voters to recall ballot information after they had voted and they did not conduct any comparison with hand-marked paper ballot voters. Additionally, the study was conducted by asking voters to review a ballot *outside the polling place*. Accordingly, the study did not reflect whether voters with a hand-marked paper ballot could recall their votes and further it apparently tested short-term memory—not verification in the precinct of a freshly printed ballot.

[13] *See, e.g.*, Florida Recounts Senate Votes Yet Again, and Nelson's Chances Dwindle, *New York Times*, Nov. 16, 2018 (*available at* https://www.nytimes.com/2018/11/16/us/rick-scott-bill-nelson-recount.html).

[14] Notably, Marilyn Marks, who I understand to be affiliated with the Coalition for Good Governance, a Plaintiff in this case, is listed as a contributor to this paper.

C. October 22, 2019 Declaration of Kevin K. Skoglund

64. I have reviewed the Declaration of Kevin K. Skoglund, dated October 22, 2019, and filed with this Court, all Paragraph references herein refer to that document, [Doc. 640-1, pp. 47–66], unless explicitly stated otherwise. I offer the following opinions in rebuttal.

65. In Paragraphs 23–24, Mr. Skoglund seems to offer the opinion that voting by hand-marked paper ballot is faster than voting by BMD paper ballot. He does so without any evidence or support for this proposition. However, in an internal study I conducted with others while at Clemson University we found the opposite—that voting by BMD is faster than hand-marked paper ballot.

66. In Paragraph 25, Mr. Skoglund references touchscreen miscalibration errors. However, these are exceedingly rare in modern touchscreen BMDs unlike older DRE touchscreen machines.

67. In Paragraph 30, Mr. Skoglund cites to a paper titled "How To Build an Undervoting Machine: Lessons from an Alternative Ballot Design," in support of his assertion that "[s]everal studies have shown that a significant number of voters do not verify machine-generated ballots carefully and do not detect errors." However, this cited paper doesn't discuss machine-generated paper ballots at all and instead concerns user interface design of BMDs and DREs. Mr. Skoglund also cites to the same unreliable study conducted by Richard DeMillo, Robert Kadel,

and Marilyn Marks that Dr. Stark used. For the reasons stated in Paragraph 13, I find this unpersuasive.

68. Mr. Skoglund makes several conclusory statements regarding the appearance of ballot summaries and abbreviations contained therein. However, he notably cites to no authority for his conclusions regarding the ability of voters to comprehend summaries and makes no allegations pertaining to a Georgia BMD-conducted election.

69. In Paragraph 37, Mr. Skoglund generally states that ballot summaries cannot be a reliable source for an audit because you cannot be sure it was properly verified. For the same reasons stated elsewhere in my Declaration, I find this unpersuasive.

D. Curling Plaintiffs' Exhibit 3: Def Con 27 Voting Machine Hacking Village Report

70. I have reviewed the Def Con 27 Voting Machine Hacking Village Report filed with this Court, [Doc. 619-9]. I offer the following opinions in rebuttal.

71. I am familiar with the Def Con Voting Machine Hacking Village, generally. This Report appears to assert several conclusory statements regarding hackability of voting machines with unlimited access. I do not see much to comment on in the Report largely because the Dominion Precinct Hybrid Scanner appears to be different than the system procured for Georgia. As such, I am not sure of the report's relevance.

E. Curling Plaintiffs' Exhibit 4: Paper authored by Appel, DeMillo, and Stark.

72. I have reviewed the Paper attached as Exhibit 4 to Curling Plaintiffs' Brief, filed with this Court at [Doc. 619-10], I offer the following opinions in rebuttal.

73. I find this Paper to be largely repetitive of previous assertions and will not waste the time of the Court by repeating them herein.

74. I agree with several points contained in this paper though. For example, I agree that that all-in-one devices should not generally be used in elections—but Georgia's BMD System is not an all-in-one system. Also, a BMD that separately prints a ballot with a readable ballot summary and scanned at a separate precinct based optical scanner with no printer head is not so insecure as to never be used.

75. I differ, however, with their conclusion that BMDs with separate scanners should only be used by disabled voters who cannot use a hand-marked paper ballot. As previously discussed, such a statement is inherently flawed in that it is permissible for a subset of voters to use a BMD Voting System but not the general populace, and further that segregating such voters only exacerbates concerns of manipulation.

[signature on next page]

I declare under penalty of perjury that the foregoing is true and correct. Executed this _13__ day of November, 2019.

Juan E. Gilbert, Ph. D.